

(b) *Special preparation for the leakproofness test.* Vented closures must either be replaced by similar non-vented closures or the vent must be sealed. For metal IBC design types, the initial test must be carried out before the fitting of any thermal insulation equipment. The inner receptacle of a composite IBC may be tested without the outer packaging provided the test results are not affected.

(c) *Test method and pressure applied.* The leakproofness test must be carried out for a suitable length of time using air at a gauge pressure of not less than 20 kPa (2.9 psig). Leakproofness of IBC design types must be determined by coating the seams and joints with a heavy oil, a soap solution and water, or other methods suitable for the purpose of detecting leaks. Other methods, if at least equally effective, may be used in accordance with appendix B of this part, or if approved by the Associate Administrator, as provided in § 178.801(i).

(d) *Criterion for passing the test.* For all IBC design types intended to contain solids that are loaded or discharged under pressure or intended to contain liquids, there may be no leakage of air from the IBC.

[Amdt. 178-103, 59 FR 38074, July 26, 1994, as amended at 64 FR 10782, Mar. 5, 1999; 66 FR 45185, 45386, Aug. 28, 2001]

#### § 178.814 Hydrostatic pressure test.

(a) *General.* The hydrostatic pressure test must be conducted for the qualification of all metal, rigid plastic, and composite IBC design types intended to contain solids that are loaded or discharged under pressure or intended to contain liquids.

(b) *Special preparation for the hydrostatic pressure test.* For metal IBCs, the test must be carried out before the fitting of any thermal insulation equipment. For all IBCs, pressure relief devices and vented closures must be removed and their apertures plugged or rendered inoperative.

(c) *Test method.* Hydrostatic gauge pressure must be measured at the top of the IBC. The test must be carried out for a period of at least 10 minutes applying a hydrostatic gauge pressure not less than that indicated in paragraph (d) of this section. The IBCs may

not be mechanically restrained during the test.

(d) *Hydrostatic gauge pressure applied.* (1) For metal IBC design types, 31A, 31B, 31N: 65 kPa gauge pressure (9.4 psig).

(2) For metal IBC design types 21A, 21B, 21N, 31A, 31B, 31N: 200 kPa (29 psig). For metal IBC design types 31A, 31B and 31N, the tests in paragraphs (d)(1) and (d)(2) of this section must be conducted consecutively.

(3) For metal IBCs design types 21A, 21B, and 21N, for Packing Group I solids: 250 kPa (36 psig) gauge pressure.

(4) For rigid plastic IBC design types 21H1 and 21H2 and composite IBC design types 21HZ1 and 21HZ2: 75 kPa (11 psig).

(5) For rigid plastic IBC design types 31H1 and 31H2 and composite IBC design types 31HZ1 and 31HZ2: whichever is the greater of:

(i) The pressure determined by any one of the following methods:

(A) The gauge pressure (pressure in the IBC above ambient atmospheric pressure) measured in the IBC at 55 °C (131 °F) multiplied by a safety factor of 1.5. This pressure must be determined on the basis of the IBC being filled and closed to no more than 98 percent capacity at 15 °C (60 °F);

(B) If absolute pressure (vapor pressure of the hazardous material plus atmospheric pressure) is used, 1.5 multiplied by the vapor pressure of the hazardous material at 55 °C (131 °F) minus 100 kPa (14.5 psi). If this method is chosen, the hydrostatic test pressure applied must be at least 100 kPa gauge pressure (14.5 psig); or

(C) If absolute pressure (vapor pressure of the hazardous material plus atmospheric pressure) is used, 1.75 multiplied by the vapor pressure of the hazardous material at 50 °C (122 °F) minus 100 kPa (14.5 psi). If this method is chosen, the hydrostatic test pressure applied must be at least 100 kPa gauge pressure (14.5 psig); or

(ii) Twice the greater of: (A) The static pressure of the hazardous material on the bottom of the IBC filled to 98 percent capacity; or

(B) The static pressure of water on the bottom of the IBC filled to 98 percent capacity.

(e) *Criteria for passing the test(s).* (1) For metal IBCs, subjected to the 65 kPa (9.4 psig) test pressure specified in paragraph (d)(1) of this section, there may be no leakage or permanent deformation that would make the IBC unsafe for transportation.

(2) For metal IBCs intended to contain liquids, when subjected to the 200 kPa (29 psig) and the 250 kPa (36 psig) test pressures specified in paragraphs (d)(2) and (d)(3) of this section, respectively, there may be no leakage.

(3) For rigid plastic IBC types 21H1, 21H2, 31H1, and 31H2, and composite IBC types 21HZ1, 21HZ2, 31HZ1, and 31HZ2, there may be no leakage and no permanent deformation which renders the IBC unsafe for transportation.

[Amdt. 178-103, 59 FR 38074, July 26, 1994, as amended at 66 FR 45185, 45386, Aug. 28, 2001]

#### § 178.815 Stacking test.

(a) *General.* The stacking test must be conducted for the qualification of all IBC design types intended to be stacked.

(b) *Special preparation for the stacking test.* (1) All IBCs except flexible IBC design types must be loaded to their maximum permissible gross mass.

(2) The flexible IBC must be filled to not less than 95 percent of its capacity and to its maximum net mass, with the load being evenly distributed.

(c) *Test method.* (1) *Design Qualification Testing.* All IBCs must be placed on their base on level, hard ground and subjected to a uniformly distributed superimposed test load for a period of at least five minutes (see paragraph (c)(5) of this section).

(2) Fiberboard, wooden and composite IBCs with outer packagings constructed of other than plastic materials must be subject to the test for 24 hours.

(3) Rigid plastic IBC types and composite IBC types with plastic outer packagings (11HH1, 11HH2, 21HH1, 21HH2, 31HH1 and 31HH2) which bear the stacking load must be subjected to the test for 28 days at 40 °C (104 °F).

(4) For all IBCs, the load must be applied by one of the following methods:

(i) One or more IBCs of the same type loaded to their maximum permissible gross mass and stacked on the test IBC;

(ii) The calculated superimposed test load weight loaded on either a flat plate or a reproduction of the base of the IBC, which is stacked on the test IBC.

(5) *Calculation of superimposed test load.* For all IBCs, the load to be placed on the IBC must be 1.8 times the combined maximum permissible gross mass of the number of similar IBCs that may be stacked on top of the IBC during transportation.

(d) *Periodic Retest.* (1) The package must be tested in accordance with paragraph (c) of this section; or

(2) The packaging may be tested using a dynamic compression testing machine. The test must be conducted at room temperature on an empty, unsealed packaging. The test sample must be centered on the bottom platen of the testing machine. The top platen must be lowered until it comes in contact with the test sample. Compression must be applied end to end. The speed of the compression tester must be one-half inch plus or minus one-fourth inch per minute. An initial preload of 50 pounds must be applied to ensure a definite contact between the test sample and the platens. The distance between the platens at this time must be recorded as zero deformation. The force "A" then to be applied must be calculated using the applicable formula:

Liquids:  $A = (1.8)(n - 1) [w + (s \times v \times 8.3 \times .98)] \times 1.5;$

or

Solids:  $A = (1.8)(n - 1) [w + (s \times v \times 8.3 \times .95)] \times 1.5$

Where:

A = applied load in pounds.

n = maximum number of IBCs being stacked during transportation.

w = maximum weight of one empty container in pounds.

s = specific gravity (liquids) or density (solids) of the lading.

v = actual capacity of container (rated capacity + outage) in gallons.

and:

8.3 corresponds to the weight in pounds of 1.0 gallon of water.

1.5 is a compensation factor converting the static load of the stacking test into a load suitable for dynamic compression testing.

(e) *Criteria for passing the test.* (1) For metal, rigid plastic, and composite